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Bounds on Inelastic Dark Matter from Neutrino Detectors

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Abstract content

Models of TeV-scale dark matter are severely constrained by increasingly precise direct detection experiments. One paradigm which can evade these bounds is Inelastic Dark Matter (iDM), where a nontrivial dark sector contains two particles with a small mass splitting δ. A typical example is a supersymmetric model in which the two lightest Higgsinos have TeV-scale masses, and the heavier one decays to the (stable) lighter one by emitting a photon of energy $\delta = \mathcal{O}(100keV)$. Previous works have bounded the iDM parameter space using the kinematics of iDM scattering in direct detection experiments. In our scenario, we observe that dark matter can upscatter against heavy elements inside the earth, travel to and decay inside of existing experiments, such as the Borexino detector at Gran Sasso. Due to unique modulation signals, it is possible to improve on previous constraints on iDM scenarios using existing data from Borexino.

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